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## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification <sup>5</sup> : <b>E01B 5/04, 21/02, B21B 1/08</b>	<b>A1</b>	(11) International Publication Number: <b>WO 91/10778</b> (43) International Publication Date: <b>25 July 1991 (25.07.91)</b>
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(21) International Application Number: PCT/GB91/00031

(22) International Filing Date: 10 January 1991 (10.01.91)

## (30) Priority data:

9000581.0	10 January 1990 (10.01.90)	GB
9013508.8	16 June 1990 (16.06.90)	GB

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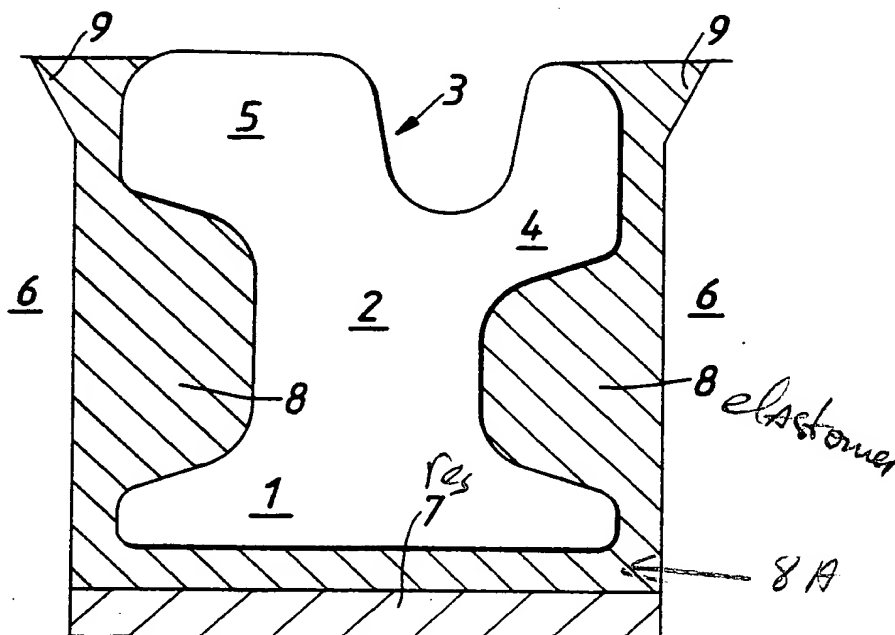
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(81) Designated States: AT (European patent), AU, BE (European patent), BR, CA, CH (European patent), DE (European patent), DK (European patent), ES (European patent), FI, FR (European patent), GB (European patent), GR (European patent), HU, IT (European patent), KR, LU (European patent), NL (European patent), NO, PL, SE (European patent), SU, US.

**Published***With international search report.**Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.*

(54) Title: IMPROVEMENTS IN AND RELATING TO TRAM TRACK



## (57) Abstract

A rail section comprising a head, a base and an intermediate web portion, the head having a wheel-rim-engaging groove (3) formed in its upper side offset from the centre line of the rail. The rail may be bonded in troughs in roadways by an elastomeric grouting compound (8) such as to form track for trams etc.

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Improvements in and Relating to Tram Track

This invention relates to rail sections and particularly but not exclusively relates to such sections for use in track (rails) for trams, trucks or the like.

Hitherto such tram track rails have been produced from steel rolled to quite complex rolling sequences by reason of the shape adopted of said track to ensure adequate structural strength, wear resistance and bonding in the roadway, bearing in mind that such track has to be compatible with both free-standing "open" dedicated sections and contiguous sections which are sited in roadways carrying other modes of transport.

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It is an object of this invention to provide an improved rail section for use in track for trams/trucks and the like.

From one aspect, the present invention provides a rail section comprising a head, a base and an intermediate web portion, the head having a wheel-rim-engaging groove formed in its upper side offset from the centre line of the rail.

Preferably, the groove lies wholly within that part of the head lying on one side of said centre line, or substantially so, and the depth of the groove may roughly equate with the depth of that portion of the head on which the wheel bears.

The profile of the rail is such that it can readily be bent laterally.

A rail in accordance with this invention may readily be bonded in grooves or troughs in roadways such that the grooved head lies flush with the surface of the roadway, or substantially so; the bonding may be effected with an elastomeric grouting compound of e.g. a polymer type. The said wheel-engaging portion of the head may lie slightly proud of the roadway surface with the portion on the other side of the groove lying flush.

The rail may be resiliently supported within the roadway groove/slot, that is, supported on means specifically directed to a resilient mounting as distinct from the inherent resilience ascribable to the bonding

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medium.

In order that the invention may be fully understood one embodiment thereof will now be described, by way of example, with reference to the accompanying drawings in which:-

Figure 1 illustrates a cross-section through the rail mounted within a groove in a roadway which may be a domestic thoroughfare, a tunnel or dockside etc; and

Figures 2 to 6 each illustrate different rail sections which may be utilised in the Figure 1 configuration - note Figure 6 in which the upper surface of the head is downwardly sloped to avoid the need for "packing" the rail to exhibit such a slope as is frequently required.

Referring now to Figure 1 in the drawings the base 1 is symmetrical whilst the web profile 2 is asymmetrical as likewise is the head. In particular, the wheel rim-engaging groove 3 is formed in the head such that it lies wholly, or substantially wholly, within that part of the head lying on one side of the centre line, hence the need for the bulk of metal within portion 4. The wheel-engaging portion 5 of the head lies at a slightly elevated level compared with that on the other side of the groove.

The rail is initially supported within a groove or trough cut or otherwise formed in e.g. a concrete roadway 6 which is then primed to bind any dust and sealed against ingress of moisture. The base of the groove may

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conveniently have a resilient "pad" 7 inserted to extend along it. Resilient wedges or plain distance pieces (not shown) are spaced at intervals along the length of the groove to support the rail section and an elastomeric polymeric grouting compound or glue 8 is then poured around the sides of, and under, the rail and allowed to set firmly; the wedges may in fact be made of the same material as the compound 8 which, for example, may be the proprietary material Icoset, Edilon or Sika.

Tram track sited in this fashion exhibits a much greater reduction in noise than other systems adopted hitherto and ground vibration is likewise reduced. Additionally, water cannot readily get under the road bed via the rail since it is completely sealed. Costs of installation are also lower than comparable systems and lifting and replacement of track sections is facilitated by the fact that the pad 7 is not bonded to the concrete base. Further, since the rail is insulated within its "housing" stray electric current leakage (in electric systems) is minimised.

Typically, the rail itself may be rolled from a length of (say) 5" square billet which exits from a roughing mill with web indentations 1 partially formed and is then processed in a finishing two-high reversing mill stand by which, in the first pass, web forming indentations 1 are more properly fashioned. The billet is then turned through 90° to enable the groove 2 in the head



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(3) to be initially fashioned in the second (reversing) pass and is then more fully fashioned in the succeeding pass. Subsequently, the partially formed section is turned back through 90° again for the web (4) to be fully formed in the fourth pass and likewise rotation back through 90° is effected to enable to groove 2 to be finish formed in the final pass.

The simple rolling technique adopted avoids the need for complex rolling schedules used hitherto and additionally avoids the need for edge rollers.

The steel utilised may conventionally be to BS 11 grade or an equivalent UIC grade, the mass of the section typically being 87 kg/metre although a lower mass of say 60 kg/metre may readily be achievable with this technique now adopted.

Although this invention has been described with reference to the particular embodiment illustrated, it is to be understood that various modifications may readily be made without departing from the true scope of this invention. For example, other rail shapes, compatible with the principles expounded on the design of the wheel adopted to run on it. The chamfers (9) may be provided on only one side of the roadway slot or omitted altogether as also may the pad 7.

CLAIMS

1. A rail section comprising a head, a base and an intermediate web portion, the head having a wheel-rim-engaging groove formed in its upper side offset from the centre line of the rail.
2. A rail section according to claim 1, in which the groove lies wholly within that part of the head lying on one side of the said centre line, or substantially so.
3. A rail section according to claim 1 or claim 2, in which the depth of the groove substantially equates with the depth of that portion of the head on which the wheel bears.
4. A rail section according to any of claims 1 to 3, which has been formed by rolling a billet initially in a roughing mill by which the web portion is partially formed, and then in a two-high reversing mill in which:-
  - (a) the web portion is more properly formed in the first roll pass, the billet is then turned through 90°, and
  - (b) the groove is initially fashioned in the second (reversing) roll pass and then more fully fashioned in the third pass, the billet is then turned back through 90°, and

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- (c) the web is fully formed in the fourth pass, the billet is then turned again through 90°, and
- (d) the groove is finish formed in the final pass.

5. A rail section according to any one of claims 1 to 4, in which the mass of the rail rolled is of the order of 60 kg/metre.

6. A rail section according to any one of claims 1 to 5, bonded in a trough in a roadway such that the grooved head lies substantially flush with the surface of said roadway to form a track for a tram, truck or the like.

7. A rail section according to claim 6, bonded in the roadway with an elastomeric polymeric grouting compound.

8. A rail section according to claim 7, supported on wedges or distance pieces located along the bottom of the trough and around which the grouting compound has been poured.

9. A rail section according to claim 7 or claim 8, in which the bonded rail is sited on a resilient pad extending along the bottom of the trough.

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10. A rail section substantially as herein described with reference to the accompanying drawings.

11. A rail section bonded in a roadway trough, substantially as herein described with reference to Figure 1 in the accompanying drawings.

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FIG. 1.

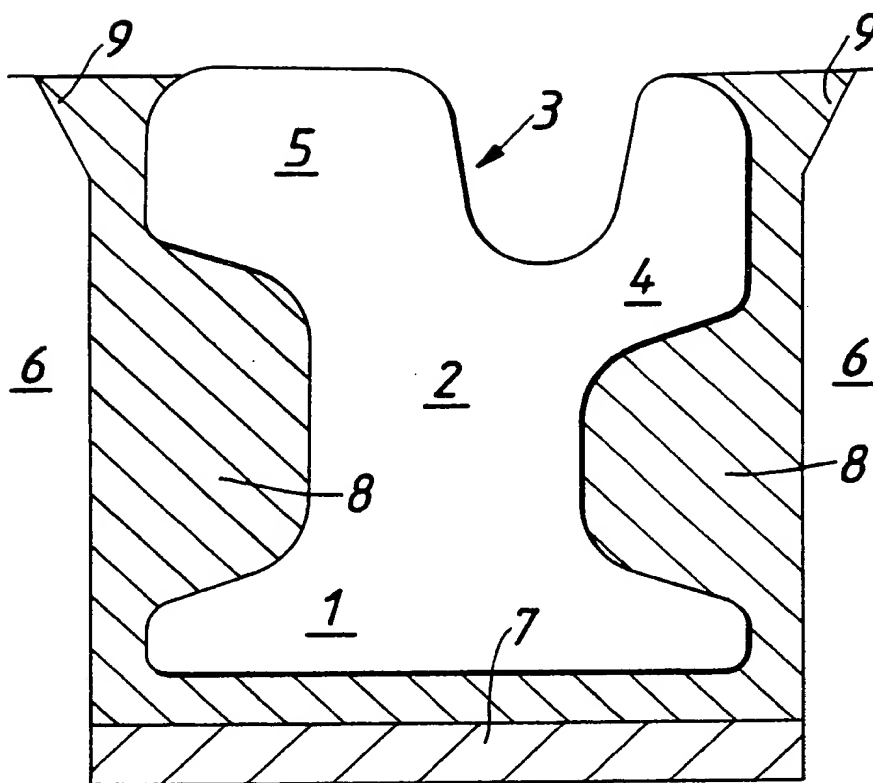
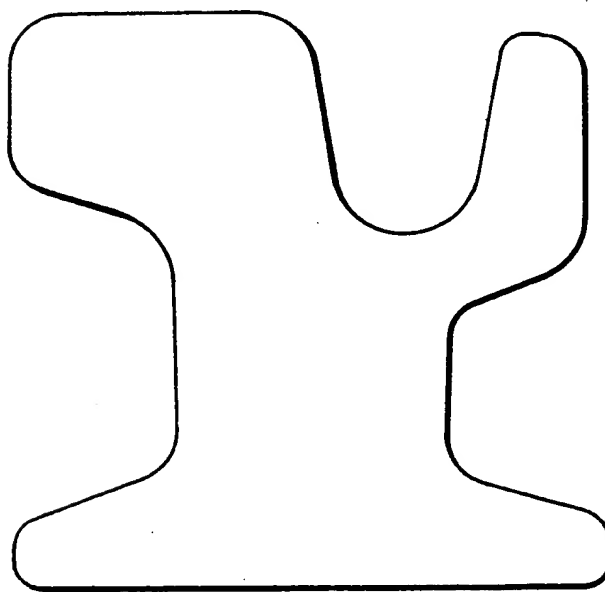
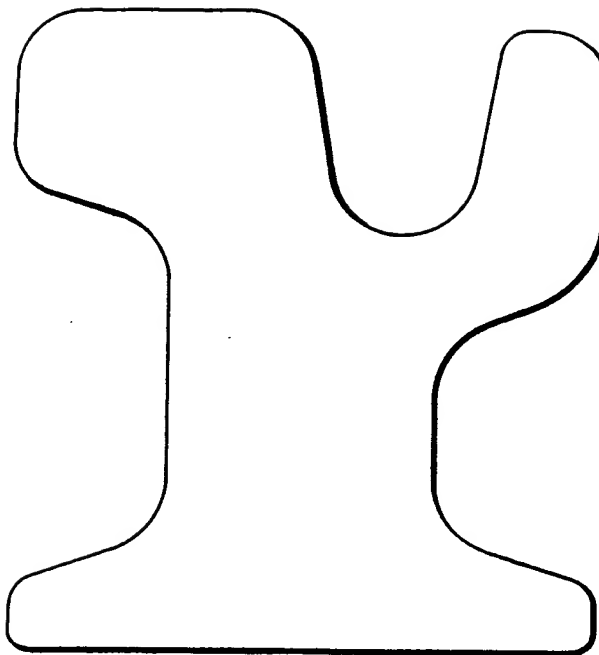


FIG. 2.

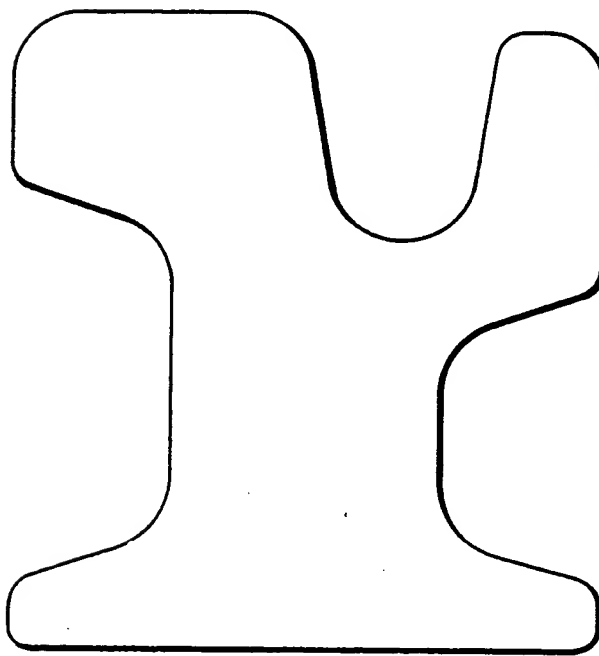


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*FIG. 3.*

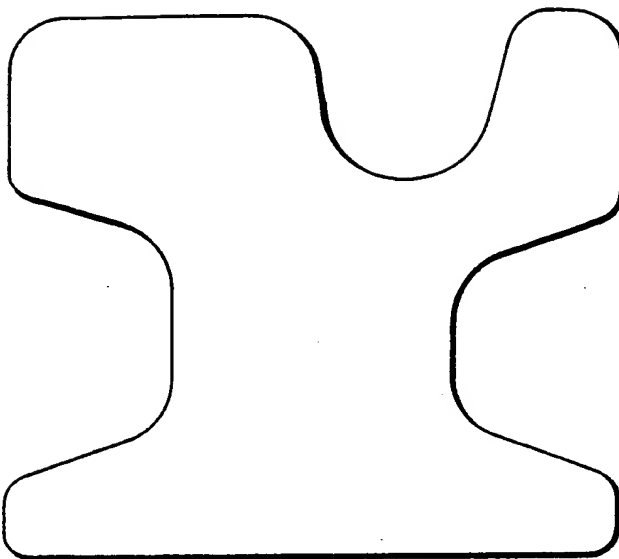


*FIG. 4.*

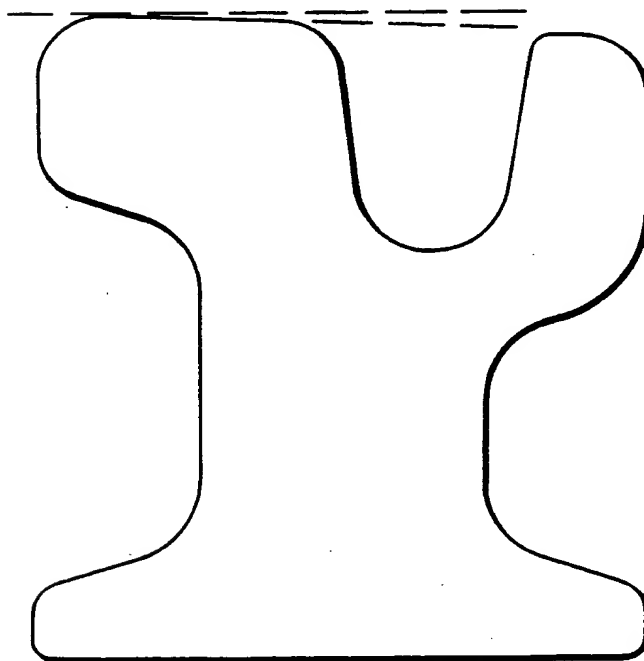


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*FIG.5.*






*FIG.6.*



# INTERNATIONAL SEARCH REPORT

International Application No PCT/GB 91/00031

<b>I. CLASSIFICATION OF SUBJECT MATTER</b> (if several classification symbols apply, indicate all) <sup>6</sup> According to International Patent Classification (IPC) or to both National Classification and IPC IPC <sup>5</sup> : E 01 B 5/04, E 01 B 21/02, B 21 B 1/08																										
<b>II. FIELDS SEARCHED</b> <div style="text-align: center; margin-top: 10px;">Minimum Documentation Searched <sup>7</sup></div> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 25%; border-bottom: 1px solid black;">Classification System</td> <td style="border-bottom: 1px solid black;">Classification Symbols</td> </tr> <tr> <td style="padding: 10px;">IPC<sup>5</sup></td> <td style="padding: 10px;">E 01 B, B 21 B</td> </tr> </table> <div style="text-align: center; margin-top: 10px;">Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched <sup>8</sup></div>			Classification System	Classification Symbols	IPC <sup>5</sup>	E 01 B, B 21 B																				
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<b>III. DOCUMENTS CONSIDERED TO BE RELEVANT <sup>9</sup></b> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 10%;">Category <sup>9</sup></th> <th style="width: 70%;">Citation of Document, <sup>11</sup> with indication, where appropriate, of the relevant passages <sup>12</sup></th> <th style="width: 20%;">Relevant to Claim No. <sup>13</sup></th> </tr> </thead> <tbody> <tr> <td style="text-align: center; vertical-align: top;">X</td> <td style="vertical-align: top;">DE, C, 608324 (FREUDINGER) 21 January 1935 see page 1, line 63 - page 2, line 7; figures 1,2</td> <td style="text-align: center; vertical-align: top;">1-3,6</td> </tr> <tr> <td style="text-align: center; vertical-align: top;">Y</td> <td style="text-align: center; vertical-align: top;">--</td> <td style="text-align: center; vertical-align: top;">9</td> </tr> <tr> <td style="text-align: center; vertical-align: top;">A</td> <td style="text-align: center; vertical-align: top;">--</td> <td style="text-align: center; vertical-align: top;">7</td> </tr> <tr> <td style="text-align: center; vertical-align: top;">Y</td> <td style="vertical-align: top;">DE, A, 3626490 (EISNER) 7 April 1988 see column 1, lines 29-36; column 2, lines 5-22; figures 1,2</td> <td style="text-align: center; vertical-align: top;">8</td> </tr> <tr> <td style="text-align: center; vertical-align: top;">A</td> <td style="text-align: center; vertical-align: top;">--</td> <td style="text-align: center; vertical-align: top;">9</td> </tr> <tr> <td style="text-align: center; vertical-align: top;">A</td> <td style="vertical-align: top;">DE, U, 8711451 (PHOENIX) 2 February 1989 see page 1, lines 14-24; figure</td> <td style="text-align: center; vertical-align: top;">--</td> </tr> <tr> <td colspan="2" style="text-align: right; padding-top: 20px;">./.</td> <td></td> </tr> </tbody> </table>			Category <sup>9</sup>	Citation of Document, <sup>11</sup> with indication, where appropriate, of the relevant passages <sup>12</sup>	Relevant to Claim No. <sup>13</sup>	X	DE, C, 608324 (FREUDINGER) 21 January 1935 see page 1, line 63 - page 2, line 7; figures 1,2	1-3,6	Y	--	9	A	--	7	Y	DE, A, 3626490 (EISNER) 7 April 1988 see column 1, lines 29-36; column 2, lines 5-22; figures 1,2	8	A	--	9	A	DE, U, 8711451 (PHOENIX) 2 February 1989 see page 1, lines 14-24; figure	--	./.		
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<b>IV. CERTIFICATE</b> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; border-bottom: 1px solid black; padding: 5px;">Date of the Actual Completion of the International Search</td> <td style="width: 50%; border-bottom: 1px solid black; padding: 5px;">Date of Mailing of this International Search Report</td> </tr> <tr> <td style="text-align: center; padding: 10px;">4th April 1991</td> <td style="text-align: center; padding: 10px;">22. 05. 91</td> </tr> <tr> <td style="border-bottom: 1px solid black; padding: 5px;">International Searching Authority</td> <td style="border-bottom: 1px solid black; padding: 5px;">Signature of Authorized Officer</td> </tr> <tr> <td style="text-align: center; padding: 10px;">EUROPEAN PATENT OFFICE</td> <td style="text-align: center; padding: 10px;">             Natalie Weinberg         </td> </tr> </table>			Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report	4th April 1991	22. 05. 91	International Searching Authority	Signature of Authorized Officer	EUROPEAN PATENT OFFICE	 Natalie Weinberg																
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III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)		
Category *	Citation of Document, <sup>1</sup> with indication, where appropriate, of the relevant passages	Relevant to Claim No.
A	DE, C, 450540 (VEREINIGTE STAHLWERKE) 11 October 1927 see page 2, lines 20-51; figure 1 --	4
A	GB, A, 15176 A.D. 1914 (THON) 26 August 1915 see page 1, lines 15-21; figure -----	10,11

# ANNEX TO THE INTERNATIONAL SEARCH REPORT ON INTERNATIONAL PATENT APPLICATION NO.

GB 9100031  
SA 43505

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE-C- 608324		BE-A- 383504 DE-C- 606324 FR-A- 744118 GB-A- 408921 GB-A- 408981	
DE-A- 3626490	07-04-88	None	
DE-U- 8711451	22-12-88	None	
DE-C- 450540		None	
GB-A- 15176		None	